

Claims

5 1. An actinic radiation curable composition comprising:

- (A) at least one actinic radiation curable, cationically polymerisable compound;
- (B) at least one cationic photoinitiator for component
10 (A); and
- (C) at least one stabiliser which is a complex of a Lewis acid and a Lewis base, provided that the Lewis acid is not a fluorine-containing boron compound; component (C) being present in the composition in an
15 amount of from 0.001 to 0.3 wt% and the relative amounts of Component (B) and Component (C) being such that the composition is stabilised relative to the corresponding composition in which Component (C) is not present.

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- 2. A composition as claimed in claim 1, in which the Lewis acid of component (C) is selected from BX_3 , AlX_3 , FeX_3 , FeX_2 , ZnX_2 , TiX_3 or TiX_4 where each X independently represents a C(1-6)alkyl or C(1-6)alkoxy group or a
25 hydrogen, chlorine, bromine, iodine or fluorine atom, provided that if the Lewis acid is BX_3 , no X is a fluorine atom.

- 3. A composition as claimed in claim 2, in which the
30 Lewis acid of component (C) is BH_3 or BCl_3 .

- 4. A composition as claimed in any one of claims 1 to 3, in which the Lewis base of component (C) is ammonia, phosphine, an amine or a phosphine.

5. A composition as claimed in claim 4, in which the Lewis base of component (C) is ammonia, phosphine or an amine or a phosphine of the general formula

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in which Z is nitrogen or phosphorus, and each R₈ independently represents a hydrogen atom (provided that

10 not more than two R₈ groups represent hydrogen); an alkyl group having from 1 to 20, preferably from 1 to 8 carbon atoms, optionally substituted by one or more phenyl groups (in which the phenyl group may be optionally substituted by one or more C(1-12)alkyl groups and/or halogen atoms)

15 or C(5-7)cycloalkyl groups; a phenyl group optionally substituted by one or more C(1-12)alkyl groups and/or halogen atoms; or a C(5-7)cycloalkyl group; or two R₈'s together represent an alkylene group having from 4 to 6 carbon atoms one or more of which may be replaced by an

20 oxygen or a sulphur atom; and in which each alkyl, cycloalkyl or phenyl group present in the compound of the formula IV may be optionally substituted by one or more, preferably one or two, groups -Z(R₈)₂.

25 6. A composition as claimed in claim 5, in which each R₈ independently represents a C(1-12)alkyl group or a phenyl group.

7. A composition as claimed in claim 1, in which

30 component (C) is selected from the group consisting of borane ammoniac complex; borane triethylamine complex; borane tributylphosphine complex; borane trimethylamine complex; borane triphenylphosphine complex; borane tributylamine complex; borane N,N-diethylamine complex;

borane N,N-diisopropyl ethylamine complex; borane dimethylamine complex; borane N-ethyl-N-isopropyl aniline complex; borane 4-methylmorpholine complex; borane 4-ethylmorpholine complex; bis-(triethylborane) 1,6-

5 diaminohexane complex; trichloroborane N,N-dimethyloctylamine complex; trichloroborane N,N-dimethyloctylamine complex; trichloroborane triethylamine complex; trichloroborane pyridine complex; trichloroborane benzylamine complex; irontrichloride triethylamine
10 complex; irontrichloride pyridine complex; and irontrichloride N,N-dimethyloctylamine.

8. A composition as claimed in claim 7, in which component (C) is boron trimethylamine complex; boron tributylphosphine complex; boron ammoniac complex; bis-(triethylborane) 1,6-diaminohexane complex; trichloroborane triethylamine complex; trichloroborane pyridine complex; trichloroborane benzylamine complex; irontrichloride triethylamine complex; irontrichloride
15 pyridine complex; or irontrichloride N,N-dimethyloctylamine.
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9. A composition as claimed in any one of claims 1 to 8, in which component (A) includes an epoxy compound.

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10. A composition as claimed in claim 9, in which component (A) includes a cycloaliphatic diepoxide.

11. A composition as claimed in claim 10, in which the 30 monomer purity of the cycloaliphatic diepoxide is 90% or higher.

12. A composition as claimed in either claim 10 or claim 11, in which component (A) includes one or more

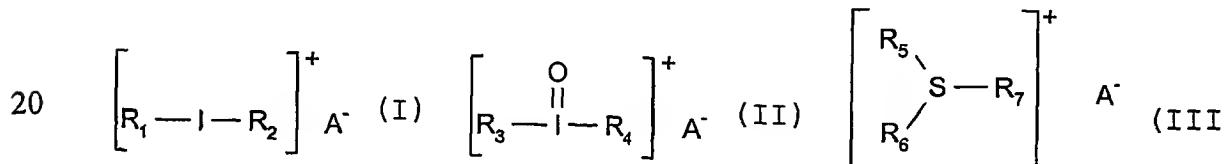
cycloaliphatic diepoxides selected from bis(4-hydroxycyclohexyl)methane diglycidyl ether, 2,2-bis(4-hydroxycyclohexyl)propane diglycidyl ether, 3,4-epoxycyclohexylmethyl-3,4-epoxycyclohexanecarboxylate,

5 3,4-epoxy-6-methyl-cyclohexylmethyl-3,4-epoxy-6-methylcyclohexanecarboxylate, di-(3,4-epoxycyclohexylmethyl)hexanedioate, di-(3,4-epoxy-6-methylcyclohexylmethyl)hexanedioate, ethylenebis(3,4-epoxycyclohexanecarboxylate), ethanediol di-(3,4-

10 epoxycyclohexylmethyl) ether and 2-(3,4-epoxycyclohexyl-5,5,3-dioxane.

13. A composition as claimed in any one of claims 1 to 12, in which component (B) is an onium salt with an anion 15 of weak nucleophilicity.

14. A composition as claimed in claim 13, in which component (B) comprises an onium salt of general formula (I), (II) or (III):



in which each of R_1 , R_2 , R_3 , R_4 , R_5 , R_6 , and R_7 independently of one another are C_6-C_{16} aryl which is unsubstituted or substituted by appropriate radicals, and A^- is $CF_3SO_3^-$ or an anion of the formula $[LQ_m]^-$, where
25 L is boron, phosphorus, arsenic or antimony,
Q is a halogen atom, or some of the radicals Q in an anion LQ_m^- may also be hydroxyl groups, and

m is an integer corresponding to the valency of L
enlarged by 1.

15. A composition as claimed in claim 14, in which
5 component (B) is a compound of the formula (III) in which
R5, R6 and R7 are phenyl and/or biphenyl.

16. A composition as claimed in any one of claims 1 to
15, which comprises a mixture of one or more cationically
10 polymerisable compounds as component (A).

17. A composition as claimed in any one of claims 1 to
16, which also comprises one or more free radically
curable substances together with a free radical initiator.

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18. A composition as claimed in claim 17, which comprises
at least one monomeric or oligomeric acrylate or
methacrylate.

20 19. A composition as claimed in any one of claims 1 to
18, which also contains a polytetrahydrofuran diol or
polyol having a molecular weight of about 250 to about
4000, or a siloxane/polyethylene oxide copolymer.

25 20. A composition as claimed in claim 1, which comprises:

a) from 40 to 80% by weight of at least one liquid epoxy
resin having an epoxy functionality of equal to or greater
than 2,

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b) from 0.1 to 10% by weight of at least one cationic
photoinitiator for component a),

c) from 5 to 40% by weight of at least one liquid diacrylate,

5 d) from 0 to 15% by weight of at least one liquid poly(meth-)acrylate having a (meth-)acrylate functionality of greater than 2,

e) from 0.1 to 10% by weight of at least one radical

10 photoinitiator for component c) and, where appropriate, d),

f) from 5 to 40% by weight of at least one OH-terminated polyether, polyester or polyurethane, and

15 g) at least one stabiliser which is a complex of a Lewis acid and a Lewis base, the Lewis acid being other than a fluorine-containing boron compound; component (g) being present in the composition in an amount of from 0.001 to 20 0.3wt%, and the relative amounts of Component (b) and Component (g) being such that the composition is stabilised relative to the corresponding composition in which Component (g) is not present.

25 21. A process for producing a cured product, which comprises treating a composition according to any one of claims 1 to 20 with actinic radiation.

22. The use of a complex of a Lewis acid and a Lewis base 30 other than one in which the Lewis acid is a fluorine-containing boron compound, as a stabiliser for a composition containing at least one radiation curable, cationically polymerisable compound and at least one cationic photoinitiator for said compound.

23. The use of a complex of a compound of the general formula BX₃, in which each X independently represents a C(1-6)alkyl group or a hydrogen, chlorine, bromine or 5 iodine atom with ammonia, phosphine, an amine or a phosphine, as a stabiliser for a composition containing at least one radiation curable, cationically polymerisable compound and at least one cationic photoinitiator for said compound.

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24. A process for the stabilization of a composition containing

(A) at least one actinic radiation curable, cationically 15 polymerisable compound; and

(B) at least one cationic photoinitiator for component (A);

20 which comprises admixing with said components (A) and (B), a complex of a Lewis acid other than a fluorine-containing boron compound and a Lewis base in an amount such that the composition is stabilised in relation to the corresponding composition not containing said complex.

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